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**National Oceanic and Atmospheric Administration**  
**NATIONAL MARINE FISHERIES SERVICE**  
Northwest Region  
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Refer to:  
2003/00729

August 18, 2003

Mr. Denis Williamson  
District Manager  
Salem District  
Bureau of Land Management  
1717 Fabry Road SE  
Salem, OR 97306

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on Control of Knotweed on Bureau of Land Management-Administered Lands in the Sandy River Basin for 2003 through 2008, Multnomah and Clackamas Counties, Oregon

Dear Mr. Williamson:

Enclosed is a biological opinion (Opinion) prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of the Bureau of Land Management's (BLM) proposed project to control knotweed using the herbicide glyphosate (Rodeo or Aquamaster or similar formulation) on BLM-administered lands in the Sandy River Basin. In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of listed Lower Columbia River (LCR) steelhead (*Oncorhynchus mykiss*) or LCR chinook salmon (*O. tshawytscha*). As required by section 7 of the ESA, NOAA Fisheries has included reasonable and prudent measures with nondiscretionary terms and conditions that NOAA Fisheries believes are necessary to minimize incidental take associated with this action.

This document also serves as consultation on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations at 50 CFR Part 600. The Sandy River and tributaries has been designated as EFH for chinook salmon and coho salmon (*O. kisutch*).

If you have questions regarding this consultation, please contact Ron Lindland of my staff in the Oregon Habitat Branch at 503.230.2315.

Sincerely,

*Michael R. Couse*  
f.1

D. Robert Lohn  
Regional Administrator

cc: Bob Ruediger, BLM  
Brad Goehring, USFWS



# Endangered Species Act - Section 7 Consultation Biological Opinion

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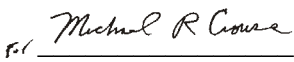
## Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

Control of Knotweed on Bureau of Land Management-Administered Lands,  
Sandy River Basin,  
Multnomah and Clackamas Counties, Oregon

Agencies: Salem District, Bureau of Land Management

Consultation  
Conducted By: NOAA's National Marine Fisheries Service,  
Northwest Region

Date Issued: August 18, 2003

Issued by:   
D. Robert Lohn  
Regional Administrator

Refer to: 2003/00729

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#### Parts per million

1 ppm = 1,000 ppb (parts per billion)

1 ppm = 1,000  $\mu$ g/L (micrograms per liter)

1 ppm = 1 mg/L (milligrams per liter)

## 1. INTRODUCTION

### 1.1 Consultation History

On June 10, 2003, NOAA's National Marine Fisheries Service (NOAA Fisheries) received a request from the Salem District of the Bureau of Land Management (BLM) for formal consultation pursuant to section 7 of the Endangered Species Act (ESA) and consultation pursuant to section 305(b) of the Magnuson-Stevens Fishery Management and Conservation Act (MSA) for a proposed project to control knotweed (*Polygonum sp.*) on BLM-administered land in the Sandy River Basin using the herbicide glyphosate (Rodeo or Aquamaster or similar formulation). The BLM will fund the project. The Nature Conservancy (TNC) whose personnel have surveyed and treated knotweed infestations in the Sandy River Basin in recent years will implement the project. A biological assessment (BA) dated June 4, 2003, accompanied the letter. Most of the known sites will be treated in 2003 or 2004. Follow-up treatments and treatment of newly discovered sites could continue for five years (through 2008).

The BLM prepared the BA. NOAA Fisheries staff provided technical assistance as part of the Willamette Province Level 1 ESA Consultation Streamlining Team (Level 1 Team) in accordance with the February 26, 1997 (revised June 1999), consultation streamlining guidelines (NOAA Fisheries *et al.* 1999). In the BA, the BLM used procedures established in NOAA Fisheries (1996) to determine the effects of the proposed action.

The BLM determined that the proposed project to control knotweed on BLM-administered lands in the Sandy River Basin may effect and was "likely to adversely affect" (LAA) Lower Columbia River (LCR) steelhead (*Oncorhynchus mykiss*) and LCR chinook salmon (*O. tshawytscha*). This proposed action is the subject of this biological opinion (Opinion). In addition, the BA provided an evaluation of the effects the proposed action would have on habitat designated as essential fish habitat (EFH) under the MSA.

### 1.2 Proposed Action

The proposed action is the funding (by BLM) and implementation by TNC of the Knotweed Control Project on BLM-administered lands in the Sandy River Basin. The purpose of the project is to control or eradicate three species of knotweed: Japanese knotweed (*Polygonum cuspidatum*), Giant knotweed (*P. sachalinense*), and Himalaya knotweed (*P. polystachyum*). These species of knotweed are native to Asia and are also known as fleeceflower. Oregon has designated these knotweeds as class "B" noxious weeds (ODA 2003) recommending "limited to intensive control at the state or county level as determined on a case-by-case basis." TNC proposes to use the herbicide glyphosate (Rodeo or Aquamaster or similar formulation) to eradicate known infestations of these knotweeds, and to prevent their further establishment and the associated loss of native riparian vegetation. Knotweed distribution in the Sandy River Basin is relatively restricted at this time. Failure to address the issue in a timely manner will result in an escalation of the problem.

Chemical treatment for knotweed is the most effective control method for established stands due to the plant's extensive root system, which can readily propagate new growth (Dawson and Holland 1999). The use of the herbicide glyphosate has proven effective at controlling knotweed (Beerling 1990, Soll *et al.* 2001). Although Beerling (1990) cautioned that herbicide use was a short-term control measure and not a method of eradication, Dawson and Holland (1999) recommended: (1) Immediately controlling new knotweed colonies before they become well established; (2) containing plant material and treating on site; (3) treating upstream sites and proceed downstream; (4) develop a long-term management policy that includes surveying; and (5) never to consider partial or incomplete control measures.

The BA describes the action, the environmental baseline in the action area, and the potential effects of the action on LCR steelhead and LCR chinook salmon in the Sandy River Basin. The project description provided in the BA submitted by the BLM is included in this document by reference and is summarized below.

The BLM manages approximately 12,580 acres (3%) of the land in the Sandy River Basin. About 70% of the basin is managed by the U.S. Forest Service and the remaining 27% is privately owned. Based on surveys conducted in the Sandy River Basin by TNC in 2002, there are approximately 10 total acres of known knotweed patches on BLM-administered lands in the Sandy River Basin. According to the BA, it is estimated that there could be up to 10 additional acres on BLM lands not yet surveyed. Even if a total of 20 acres of knotweed are treated on BLM-administered lands, this would amount to less than 0.02% of BLM land in the basin and less than 0.005% of the total land in the basin. Known knotweed patches in the Sandy River Basin range in size from a single plant to a group of plants covering more than an acre. Project sites on BLM land in the Sandy River 4<sup>th</sup> Field Watershed are primarily in riparian areas with a few upland sites throughout the Lower Sandy, Middle Sandy, and Salmon River 5<sup>th</sup> Field Watersheds. TNC surveys have been conducted from the mouth of the Sandy River up to RM 38 (Brightwood Bridge). Watersheds and currently known acres of knotweed to be treated on BLM-administered land over the course of the proposed project are listed below:

- Salmon River (HUC# 1708000101) 5<sup>th</sup> Field Watershed. One of the worst infestations of knotweed on BLM-administered lands in the Sandy River Basin occurs along the Salmon River approximately one mile upstream from its confluence with the Sandy River (T2S, R6E, Section 25) where a patch approximately 0.25 acre in size is found. The currently known total infestation on BLM-administered lands in the Salmon River 5<sup>th</sup> Field watershed is approximately 2.8 acres. This is approximately 29% of the known area of knotweed infestation on BLM-administered lands in the Sandy River Basin.
- Lower Sandy (HUC#1708000108) 5<sup>th</sup> Field Watershed. Mostly within the Trout Creek 6<sup>th</sup> Field Watershed. The currently known total infestation on BLM-administered lands is 1.46 acres. This is approximately 16% of the known area of knotweed infestation on BLM-administered lands in the Sandy River Basin.

- Middle Sandy HUC#1708000104) 5<sup>th</sup> Field Watershed. Currently known total infestations on BLM-administered lands are 1.71 acres in the Lower Middle Sandy 6<sup>th</sup> Field Watershed and 3.58 acres in the Upper Middle Sandy 6<sup>th</sup> Field Watershed. This total of 5.29 acres is approximately 55% of the known area of knotweed infestation on BLM-administered lands in the Sandy River Basin.

This project was developed following review of a similar effort conducted by TNC on private lands along the Sandy River, Oregon over the past three years (Soll *et al.* 2001). According to the BA, manual control alone has proven labor intensive and ineffective at eradicating knotweed. Most of the known sites will be treated in 2003 and 2004, depending on when treatments can be started. More than 90% of the applications (direct stem injection, wicking, and foliar application) will occur from May through October, and will cease at the onset of the rainy season in late October. Glyphosate quantities used in each watershed would decline following the 2003 and 2004 applications, respectively.

According to the BA, the BLM's preferred treatment method is direct injection of glyphosate into the knotweed stems. The stem injection method is only applicable to knotweed stems which are 0.75 inch in diameter or greater. Based on TNC surveys, it is estimated that up to 90% of the knotweed stems on BLM lands are large enough to be injected. Each stem would be injected with 5 milliliters (or 5 cubic centimeters) of 100% concentration Rodeo or Aquamaster. For the injection method, the proposed glyphosate application concentration (100%) would be 648,000 milligrams per liter (or 648,000 ppm). While labor intensive, the injection method has demonstrated excellent efficacy with no regrowth observed 22 months after injection (Crockett *et al.* 2002). Although more herbicide is used with this application method, there is virtually no chance of the herbicide making direct contact with other plant species or an open water surface. As an alternative to direct injection, a wicking method would be used wherein some knotweed stems will be cut and a 50% solution (324,000 ppm) of herbicide (Rodeo or Aquamaster) applied to the cut stems.

Knotweed plants that are too small for injection or wicking (stems less than 0.75 inch in diameter and plants usually less than approximately 4 to 5 feet in height) and that are more than 10 feet from water will be sprayed with Rodeo, or a similar formulation. The herbicide would be applied using low pressure spray application from either a backpack sprayer with a 4 to 5 gallon capacity, or hand-carried sprayer with a 1 to 2 gallon capacity. Use of low pressure application results in droplet sizes large enough to essentially eliminate drift. Contact with non-target vegetation is limited to small plants growing beneath or within patches of knotweed. When foliar application is used, the herbicide is diluted to 5% or less. The surfactant, LI-700, is proposed for use with the Rodeo, or a similar formulation, to enhance herbicide adhesion to target plants and increase effective absorption. Most sites where foliar application is used will be treated once or twice during the growing season for knotweed. Most sites will be treated once from July to October. Approximately 25% of the sites will be treated twice, once in May-June and once in October, and less than 1% of the sites will be treated three times late April/May, July, and October. Foliar glyphosate treatments have exhibited 95% efficacy at controlling

knotweed when applied twice during the growing season or applied once in the fall following cutting to ground level in early summer (Soll *et al.* 2001).

Based on TNC's previous work, it is estimated that a total of 20 gallons of herbicide (Rodeo or Aquamaster) will be needed to treat knotweed infestations on BLM-administered lands in the Sandy River Basin. This total includes all three treatment types: Stem injection, wicking, and foliar application. As stated above, the majority of the sites would be treated in 2003 and 2004. Knotweed patches to be treated occur intermittently along approximately seven miles of the Sandy and Salmon Rivers and two miles of various tributary streams.

The BLM included a list of project design features in the BA (see pages 5 and 6). These features include, in part:

#### Project Design Features.

1. Trained individuals will apply herbicides using only stem injection, low pressure spot spray, or direct wicking application methods and in accordance with label instructions.
2. Only glyphosate in the form of Rodeo, Aquamaster, or a similar formulation will be used for this project. The herbicide will be used at 100% concentration for the stem injection method. It will be diluted to 50% or less active ingredient when applied directly on fresh stem cuts (direct wicking), and up to 5% when applied to foliage using low pressure application.
3. Spray activities will only occur during calm, dry weather conditions to prevent drift and runoff. No spraying will occur during rain or high wind events (*i.e.*, over 5 miles per hour), or if precipitation has been forecasted within 24 hours of spraying.
4. For foliar spray applications, only low pressure sprayers with large droplet nozzles will be used to minimize drift potential.
5. Spray applications will be used only on plants less than 4 to 5 feet tall, and usually smaller.
6. Plants with stems over 0.75 inch in diameter will be treated by direct injection.
7. No herbicides will be applied to open water (surface water) or applied to plants in standing water.
8. Only daily use quantities of herbicides will be transported to the project site.
9. Areas used for mixing herbicides will be placed where an accidental spill will not run into surface waters or result in groundwater contamination. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.
10. A spill kit will be on site during all herbicide application (minimum FOSS Spill Tote – Universal or equivalent).
11. Equipment cleaning and storage and disposal of rinsates and containers will follow all applicable state and Federal laws.
12. Most knotweed patches on BLM-administered lands in the Sandy River Basin have overland access. However, some sites may only be reached by water travel. Typically, an inflatable kayak will be used, but rubber rafts may occasionally be used. The following measures will be used to prevent a spill during water transport:

- a. No more than 2.5 gallons of glyphosate will be transported per kayak, and typically it will be one gallon or less. If a raft is used, no more than 5 gallons will be transported on the raft. It is estimated that no more than 5 gallons will be transported on any given day.
- b. Glyphosate will be carried in 1 gallon or smaller plastic containers. The containers will be wrapped in plastic bags and then sealed in a dry-bag. The dry-bag will be secured to the watercraft.
- c. Only the most experienced kayakers on the team on any given day will transport the chemicals.

## **2. ENDANGERED SPECIES ACT**

### **2.1 Biological Opinion**

NOAA Fisheries listed LCR steelhead as threatened under the ESA on March 19, 1998 (63 FR 13347) and LCR chinook salmon as threatened on March 24, 1999 (64 FR 14308). NOAA Fisheries issued protective regulations for each of these evolutionarily significant units (ESUs) under section 4(d) of the ESA on July 10, 2000 (65 FR 42422). Critical habitat is currently not designated or proposed for these species.

The objective of this Opinion is to determine whether the BLM's proposed knotweed control project in the Sandy River Basin for 2003-2008 is likely to jeopardize the continued existence of LCR steelhead or LCR chinook salmon.

#### **2.1.1 Biological Information**

The listing status and biological information for LCR steelhead are described in Busby *et al.* (1996) and NMFS (1997). The listing status for LCR chinook salmon are described in Myers *et al.* (1998). The Sandy River and certain tributaries in the project area and downstream provide spawning, rearing, and migratory habitat for both adult and juvenile life stages of LCR steelhead and LCR chinook salmon.

Essential features of the adult spawning, juvenile rearing, and adult and juvenile migratory habitats for both species are: Substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food (juvenile only), riparian vegetation, space, and safe passage conditions. The essential features that the proposed project may affect are water quality and riparian vegetation.

Adult LCR winter steelhead are present in the Sandy River Basin from November to June. The native stocks are mostly winter-run fish, although a small summer-run may have been present historically (FS 1996). Hatchery summer steelhead were introduced into the Sandy River in 1975. For winter-run fish, spawning begins in late-February and peaks in April and early-May. Eggs incubate in the gravels for 35-50 days and fry emerge two to three weeks after hatching,

which means that eggs or sac fry may be present in the gravel until early-July. Juvenile steelhead rear year-round in the Upper Sandy River and tributaries.

Both fall-run and spring-run LCR chinook salmon are present in the Sandy River Basin. Adult spring-run chinook salmon enter the Sandy River in March. Spawning peaks in September and early-October (FS 1996). The Salmon River is a primary spawning area for these fish. There appear to be three stocks of fall chinook salmon in the Sandy River Basin. The early maturing tule stock of fall chinook salmon enter the Sandy River in August, spawn from late September to mid-October, with fry emergence occurring in February. The late-fall stock enters the Sandy River in October, spawns in late October through December, with fry emergence in April. The third stock, referred to as “winter” run spawn from December through February with fry emergence in late-May or June (FS 1996).

### **2.1.2 Evaluating Proposed Actions**

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of: (1) Defining the biological requirements of the listed species; and (2) evaluating the relevance of the environmental baseline to the species’ current status.

Subsequently, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of mortality attributable to: (1) Collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed species’ life stages that occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize the listed species, it must identify reasonable and prudent alternatives for the action.

NOAA Fisheries also evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species’ critical habitat. NOAA Fisheries must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. NOAA Fisheries identifies those effects of the action that impair the function of any essential element of critical habitat. NOAA Fisheries then considers whether such impairment appreciably diminishes the habitat’s value for the species’ survival and recovery. If NOAA Fisheries concludes that the action will adversely modify critical habitat, it must identify any reasonable and prudent alternatives available.

For the proposed action, NOAA Fisheries’ jeopardy analysis considers direct or indirect mortality of fish attributable to the action. Because critical habitat is not currently designated for LCR steelhead or LCR chinook salmon, NOAA Fisheries did not include a critical habitat analysis.

### **2.1.2.1 Biological Requirements**

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list the species for ESA protection and also considers new data available that is relevant to the determination.

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally-reproducing population levels, at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment. Essential habitat features for survival and recovery of LCR steelhead and LCR chinook salmon include: Substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food (juvenile only), riparian vegetation, space, and safe passage conditions.

For this consultation, the biological requirements are improved habitat characteristics that function to support successful adult and juvenile migration, adult holding, spawning, egg incubation, and rearing. In spite of increased returns in recent years, the status of LCR steelhead and LCR chinook salmon, based on their risk of extinction, has not significantly improved since the species was listed. This elevated extinction risk is largely reflective of the cyclic nature of oceanic conditions, freshwater habitat conditions that are degraded and not properly functioning, and hatchery practices that threaten the species' ability to survive the natural range of habitat variability.

### **2.1.2.2 Environmental Baseline**

In step 2 of NOAA Fisheries' analysis, we evaluate the relevance of the environmental baseline in the action area to the species' current status. The environmental baseline is an analysis of the effects of past and ongoing human-caused and natural factors leading to the current status of the species or its habitat and ecosystem within the action area. The action area is defined by NOAA Fisheries regulations (50 CFR 402.02) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action". For the purposes of this consultation, the action area includes stream reaches within or beside BLM-administered lands in the Sandy River Basin where herbicides will be transported, stored, mixed, and applied incidental to the proposed action, extending 100 feet downstream where concentrations decline to below effects threshold.

The current population status and trends for LCR steelhead are described in Busby *et al.* (1996) and NMFS (1997), and for LCR chinook salmon in Myers *et al.* (1998). In general, the current status of LCR steelhead and LCR chinook salmon populations is the result of several long-term,

human-induced factors (*e.g.* habitat degradation, water diversions, hydropower dams) that serve to exacerbate the adverse effects of natural environmental variability from such factors as drought, floods, and poor ocean conditions.

Environmental baseline conditions within the action area were evaluated for the subject action at the project level and watershed scales. This evaluation was based on the “matrix of pathways and indicators” (MPI) described in “Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale” (NMFS 1996). This method assesses the current condition of instream, riparian, and watershed factors that collectively provide properly functioning aquatic habitat essential for the survival and recovery of the species.

In the Middle Sandy 5<sup>th</sup> Field Watershed, 10 of the 18 habitat indicators in the MPI were rated as not properly functioning. These were: Water temperature, physical barriers, large woody debris, pool frequency, off-channel habitat, width/depth ratios, streambank condition, floodplain connectivity, changes in peak/base flows, and disturbance history. Six of the 18 indicators were rated as functioning “at risk.” These were: Sediment/turbidity, pool character and quality, refugia, drainage network increase, road density and location, and riparian reserves. Only the chemical concentration/nutrients and substrate indicators were rated as properly functioning.

In the Salmon River 5<sup>th</sup> Field Watershed, the pool frequency and off-channel habitat indicators were rated as not properly functioning. Thirteen of the 18 indicators were rated as functioning “at risk.” These were: Water temperature, sediment/turbidity, chemical concentration/nutrients, large woody debris, pool character and quality, refugia, width/depth ratio, floodplain connectivity, changes in peak/base flows, drainage network increase, road density and location, riparian reserves, and disturbance history. The physical barriers, substrate, and streambank condition indicators were rated as properly functioning.

Due to the knotweed infestations, the project areas contain few natural habitat components and little native vegetation. Knotweed has the ability to spread quickly and out-compete native vegetation communities, which reduces the diversity present in the stream influence zone. Frequently, understory vegetation is absent within knotweed stands due to this domineering growth characteristic. By reducing diversity of the plant community, the diversity of the animal community that depends on that vegetation may also be reduced, including terrestrial and aquatic insects that are consumed by juvenile LCR steelhead and chinook salmon and other aquatic species that reside in adjacent streams and rivers. Knotweed also has the potential to limit future large wood recruitment to the stream by restricting the establishment of seedlings in the stream influence zone. The suppression of stream-side tree development reduces future cover for juvenile fish and the formation of complex pools that would result from wood recruitment. Knotweed also stabilizes gravel bars in and along the streams that may increase bank erosion. Erosion generates turbidity, which may stress juvenile fish and reduce the egg survival when fines are deposited in spawning sites. Stressed fish are more susceptible to disease and predation.

Information about herbicide levels in Sandy River Basin streams is limited. However, since Oregon forest practice rules do not preclude measurable concentrations of pesticides reaching streams, and stormwater runoff has commonly been found to contain pesticides applied to areas with urban, agricultural and forestry land uses (Spence *et al.* 1996, ODF 2000; Ewing 2000), NOAA Fisheries assumes some localized herbicide contamination of streams in the action area exists. In addition, TNC has been using glyphosate to control knotweed on private lands in the Sandy River Basin for the past three years.

Several streams in the Sandy River Basin (*e.g.* mainstem Sandy River from its mouth to RM 29.9, Gordon Creek, Cedar Creek, and Bull Run River) appear on the Oregon Department of Environmental Quality (ODEQ) 303(d) List of Water Quality Limited Water Bodies for temperature and dissolved oxygen (ODEQ 2002).

Based on the best information available on the current status of LCR steelhead and LCR chinook salmon, and NOAA Fisheries' assumptions given the information available regarding population status, population trends, and the poor environmental baseline conditions within the action area, the environmental baseline does not currently meet all of the biological requirements for LCR steelhead or LCR chinook salmon. Actions that promote or do not retard attainment of properly functioning aquatic conditions, when added to the environmental baseline, are necessary to meet the needs of the species (*i.e.*, survival and recovery of listed fish).

### **2.1.3 Analysis of Effects**

#### **2.1.3.1 Effects of Proposed Action**

In step 3 of NOAA Fisheries' analysis, we identify and evaluate the potential effects of the proposed action on the listed species with consideration of the existing environmental baseline in the action area, including whether the proposed action contributes to or maintains a degraded baseline condition.

##### **2.1.3.1.1 General Effects**

Because of their proximity and connections to streams, ecological conditions and processes in riparian areas strongly influence aquatic habitats. Riparian areas function to: (1) Provide shade, cover, and channel structural elements; (2) supply and process nutrients; (3) support food webs; (4) supply substrate materials; (5) stabilize streambanks; (6) filter upland sediments; and (7) provide linkages to side channels, floodplains, and groundwater (Sullivan *et al.* 1987, Gregory *et al.* 1991, FEMAT 1993, Spence *et al.* 1996).

Most riparian area functions affecting streams and anadromous fish (including bank stability, shade, litterfall, large wood recruitment) occur within a distance equal to the height of a site-potential tree from the edge of the streambank (FEMAT 1993, p. V-27; Spence *et al.* 1996, p. 216-220) for streams without a floodplain, and decline rapidly beyond that distance. Where there is a floodplain, riparian area functions may extend for a distance equal to the height of a

site-potential tree from the edge of the floodplain, since during a flood the entire floodplain can function as the stream channel (Rhodes *et al.* 1994). Activities that adversely affect riparian area habitat conditions frequently translate into adverse effects on salmonids in adjacent waterways.

The effects of chemical herbicide use frequently extend beyond the intended target species. Herbicide composition (including inert ingredients, carrier agents, and surfactants), chemical character, environmental conditions, and application techniques are among the parameters that determine the degree to which herbicide effects will impact non-target species and their ecosystems. Scientific studies have documented lethal effects, and to a lesser degree sublethal effects, of herbicide ingredients on many species. These studies are typically laboratory-derived and findings may vary greatly. Conditions in the field may exhibit a greater variability in toxicity (Henry *et al.* 1994) with pre-existing conditions ameliorating effects in some instances and amplifying effects in others. Sublethal effects on fish of herbicide use may include reduced growth, decreased reproductive success, altered behavior, and reduced resistance to stress (Spence *et al.* 1996).

Aquatic biota may be direct exposure to herbicides where they are applied directly to stream channels. However, risks of contamination can be reduced if adequate no-spray buffers are maintained (Heady and Child 1994). The risk is further reduced by use of hand application techniques, as opposed to aerial application, and adherence to conservation measures that minimize the risk of drift or exposure resulting from spill events. However, as Spence *et al.* (1996) state, “toxic levels of chemicals may reach streams from storm runoff and wind drift even when best management practices are employed”.

Indirect exposure vectors may result from surface and subsurface transport. Potential habitat responses include reduction in riparian vegetation, increased aquatic solar radiation, elevated stream temperatures, and reduced prey base. The loss of riparian vegetation may also decrease the amount of organic litter and large wood delivered to streams. Furthermore, bank instability may result from the loss of vegetation root structure, increasing sedimentation and reducing cover for fish.

In addition to effects of active ingredient toxicity, inert ingredient toxicity is frequently overlooked and is often little studied or understood. Similarly, LC<sub>50</sub> values may not be adequate to predict *take* in the context of the ESA. By definition, LC<sub>50</sub> values indicate the concentration at which half of the subject species dies as a result of exposure. Therefore, clearly any concentrations that approach the LC<sub>50</sub> values can be construed to constitute *take*. While sublethal effects equally constitute *take* in terms of the ESA, the concentrations that result in such effects remain imprecise.

#### **2.1.3.1.2 Effects of Rodeo® or AquaMaster® Application**

The Rodeo® (Dow Agrosiences) and AquaMaster® (Monsanto) formulations are comprised of glyphosate (53.8%) and water (46.2%) as the carrier agent. These two formulations are

comparable. Toxicity information presented herein for the Rodeo® formulation also applies to the AquaMaster® formulation.

Glyphosate is a non-selective, broad-spectrum herbicide. Absorbed by leaves and translocated throughout the plant, glyphosate disrupts the photosynthetic process by preventing the synthesis of amino acids required for the construction of proteins. The herbicide affects a wide variety of plants, including grasses and many broadleaf species, and has the potential to eliminate desirable as well as undesirable vegetation. Plant selectivity can be achieved by using injection or wiping application methods. As stated above, the direct injection method is expected to be used on 60 to 90% of the knotweed stems found on BLM-administered land in the Sandy River Basin. Application is only effective to plants that are not immersed and efficacy may be reduced if plants are inundated after application (*e.g.*, rising tidal or flood waters). Glyphosate application to water may reduce pH (Anton *et al.* 1994).

Glyphosate is strongly adsorbed by soil and does not retain herbicidal properties following contact with soil. Some information indicates the presence of phosphate ions may impair or reverse glyphosate adsorption (Norris *et al.* 1991). The half-life of glyphosate in soil can range from three to 249 days (FS 2000). In general, glyphosate degradation is dependent on soil texture and organic content (FS 2000). Degradation is rapid in soils of low organic content, and slower in soils with high organic content (Tu *et al.* 2001). “Strong adsorption to soil particles slows microbial degradation, allowing glyphosate to persist in soils and aquatic environments” (Tu *et al.* 2001). Adsorption increases with increasing clay and organic content (FS 2000, Tu *et al.* 2001).

The main break-down products of glyphosate are aminomethylphosphonic acid (AMPA) or glycine, which are further broken down by soil microorganisms (Norris *et al.* 1991). One hundred nineteen days after treatment with Rodeo® at 4.7 L ha<sup>-1</sup>, glyphosate concentrations in the estuarine mudflats of Willapa Bay, Washington, declined 51% to 72%, while AMPA did not degrade during that period (Simenstad *et al.* 1996). No short- or long-term effects to the benthic community were detected.

Glyphosate dissolves easily in water (Norris *et al.* 1991). However, because glyphosate is strongly adsorbed by soil particles, it is not easily released back into water moving through soil. In the project area, glyphosate has the greatest potential to enter flowing water due to direct deposition from drift or accidental spill during application. Indirect contamination may result from over-ground runoff that transports contaminated soil particles to waterways during spring and fall rains, or from inundation of treatment sites in floodplains. Glyphosate entering the water may quickly be bound to sediment and suspended particulates (Solomon and Thompson 2003), although some studies indicate it may remain in freshwater a “long time” (Anton *et al.* 1994). Tests show that the half-life for glyphosate in water ranges from 35 to 63 days. In British Columbia, following application of glyphosate using a no-spray buffer and very low concentrations of glyphosate the breakdown product AMPA were sometimes observed in water and sediments of streams after the first heavy rain following application (FS 2000). These findings were consistent with a study where glyphosate was applied to agricultural watersheds

that found the highest concentrations in runoff one to 10 days, and detection up to 4 months, after application (Norris *et al.* 1991). The same study found the maximum amount of herbicide transported by runoff was 1.85% of the applied amount, and that in each of the three study years, “the first runoff event after treatment accounted for 99% of the total herbicide runoff...”. (Norris *et al.* 1991). In over-water applications, higher peak concentrations were always observed in water following heavy rain events up to three weeks after application, and sediment peaks were observed later and persisted in stream sediments for more than one year (FS 2000).

#### Habitat Effects.

By design, use of glyphosate would reduce stream bank and floodplain vegetation, including any treated native vegetation. However, use of the stem injection method on 60 to 90% of the knotweed stems to be treated on BLM lands would eliminate the killing of non-target plant species. Elimination of the knotweed may result in short-term increases of direct solar radiation reaching adjacent streams and contribute to elevated water temperatures. Due to the scattered distribution of the treatment areas, NOAA Fisheries does not expect measurable increases in water temperature resulting from the proposed action. In the long term, the re-establishment of natural vegetation should restore shade and reduce water temperature. The reduction of vegetation on gravel bars should re-establish the natural mobility of these geomorphological features allowing natural transport of bedload sediment to resume. The removal of knotweed from gravel bars could provide a source of spawning gravel and increase the channel cross-sectional area, which may reduce off-site bank erosion and turbidity. The potential increase in suspended sediment generated by increased gravel bar mobility is likely to be a fraction of that currently produced by the restricted flow capacity of the existing channel in knotweed infested areas.

Turbidity, including that due to suspended sediment, can at moderate levels reduce primary and secondary productivity, and at high levels, has the potential to injure and kill adult and juvenile fish, and may also interfere with feeding (Bjornn and Reiser 1991, Spence *et al.* 1996). Sustained periods of high turbidity may reduce prey acquisition and adversely affect growth. Other behavioral effects on fish, such as gill flaring and feeding changes, have been observed in response to pulses of suspended sediment (Berg and Northcote 1985). Fine, redeposited sediments also have the potential to reduce primary and secondary productivity (Spence *et al.* 1996), and to reduce incubation success (Bell 1991) and cover for juvenile salmonids (Bjornn and Reiser 1991). Behavioral avoidance of turbid waters may be one of the most important effects of elevated suspended sediments (Scannell 1988, Birtwell *et al.* 1984, DeVore *et al.* 1980). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (Servizi and Martens 1991; Scannell 1988; Lloyd 1987; McLeay *et al.* 1984 & 1987; Sigler *et al.* 1984).

#### Biological Effects.

Glyphosate is “moderately to very slightly toxic” to fish (Table 1) (Mensink and Janssen 1994). The Material Safety Data Sheet for Rodeo® indicates the acute LC<sub>50</sub> for rainbow trout of the 53.8% glyphosate formulation is 60 ppm (Dow 2000). This reflects the toxicity of application methods that do not dilute the formulation (*e.g.*, injection, wiping). As stated above, it is

expected that from 60 to 90% of the knotweed stems will be treated by injection of undiluted Rodeo or Aquamaster.

Glyphosate sub-lethal effect concentrations for salmonids have not been well studied. Following exposure (14-day) to sub-lethal glyphosate concentrations, a study using carp found histopathological changes in gills and liver structure, as well as in liver, heart, kidney, and serum enzyme activity (Neskovic *et al.* 1996). The threshold gill and liver histopathological responses were observed at concentrations equal to 0.8% (5 ppm) and 1.6% (10 ppm), respectively, of the 96-hour LC<sub>50</sub> for that species (620 ppm). The gill histopathological response was thought to be reparable if the fish were relocated to uncontaminated water; however, the liver fibrosis could be indicative of serious liver damage. Statistically significant changes in enzyme activity were observed at 0.4% of the 96-hour LC<sub>50</sub>, the lowest exposure concentration, in liver (alkaline phosphatase,  $P < 0.01$ ; and glutamic-pyruvic transaminase,  $P < 0.05$ ) and kidneys (glutamic-oxaloacetic transaminase,  $P < 0.05$ ; and glutamic-pyruvic transaminase,  $P < 0.05$ ). Responses to chemical exposure vary by species, but equivalent exposure concentrations (0.4%, 0.8%, and 1.6% of the 96-hour LC<sub>50</sub>) for salmonids would be 4.4 ppm, 8.8 ppm, and 17.6 ppm.

Glyphosate exposure (Roundup<sup>®</sup> formulation) tests with rainbow trout found sac-fry the most sensitive life stage followed by emergent fry (Norris *et al.* 1991). Eyed eggs were the most resistant life stage. At a given life stage, there is some suggestion that toxicity does not significantly ( $P < 0.05$ ) differ based on specimen size (Mitchell *et al.* 1987). Osmoregulatory function in coho salmon smolt exposed to low concentrations (~50% LC<sub>50</sub> value) of Roundup<sup>®</sup> was not found to be effected (Mensink and Janssen 1994, section 9.1.2.3). Although exposure via ingestion has been demonstrated (Henry *et al.* 1994), studies on carp suggest glyphosate has a low potential for bioconcentration (FS 2000).

Glyphosate formulations are “moderately to very slightly toxic to aquatic invertebrates (Mensink and Janssen 1994, section 9.1.2.2). The 96-hour LC<sub>50</sub> values range from 218 to 1,216 ppm (Henry *et al.* 1994) (Table 1). Exposure may occur by ingestion of contaminated particulates, and increased suspended solids may increase toxicity. Additions of clay increased toxicity to *Daphnia* (Mensink and Janssen 1994). Conversely, toxicity to *Daphnia* was decreased by aeration (Mensink and Janssen 1994). Therefore, glyphosate in well-oxygenated, turbulent streams (*e.g.*, headwater streams) with few suspended solids may be less toxic to aquatic invertebrates than slow moving rivers with high levels of suspended solids (*e.g.*, lower river reaches). Aeration did not affect toxicity to rainbow trout (Mensink and Janssen 1994, section 9.1.2.3). Mayfly nymphs did not avoid low concentrations (0.2 to 2 ppm) of the Roundup<sup>®</sup> formulation, however, the nymphs avoided concentrations equal to the 96-hour LC<sub>50</sub> value (Mensink and Janssen 1994). Aquatic macroinvertebrate density declined by 42% was for a 1.5 year period following treatment with Roundup<sup>®</sup> (Spence *et al.* 1996).

Glyphosate toxicity is affected by environmental factors (*e.g.*, water hardness, temperature, or pH) (Mitchell *et al.* 1987, Norris *et al.* 1991, Anton *et al.* 1994, Henry *et al.* 1994, Mensink and Janssen 1994, SERA 1997). Toxicity increases at lower pH levels and higher temperatures (Henry *et al.* 1994; Mensink and Janssen 1994, section 9.1.2.3; SERA 1997). With regard to pH,

surfactants may have the opposite relationship and exhibit increased toxicity in alkaline waters (SERA 1997, FS 2000).

Surfactants would not be used with the injection or wicking methods. However, the surfactant LI700 would be used in areas where stems are too small for injection, and foliar spray application is used. The aquatic toxicity of surfactants recommended for use with Rodeo® varies greatly, though the toxicity of the proposed surfactant (*i.e.*, LI-700®) is relatively low (Table 1). Surfactants would constitute 1% or less of the applied herbicidal solution. LI-700® (Loveland Industries, Inc.) consists of phosphatidylcholine, propionic acid, and alkylpoloxyethylene ether (80%). The remaining 20% is identified only as “constituents ineffective as adjuvant” (SERA 1997). The additive effect of the surfactant on the toxicity of the applied solution is poorly understood. SERA (1997) reported, “data appear to be inadequate for a quantitative assessment of ecological effects of the surfactant,” LI-700®. Glyphosate has been found to have an antagonistic effect on the toxic action of a surfactant (Mensink and Janssen 1994). The actual toxicity of the applied solution is likely between that identified for a 5% Rodeo® solution and the surfactant alone (Mitchell *et al.* 1987). Henry *et al.* (1994) found Rodeo® and the adjuvants X-77 Spreader® and Chem-Trol® were additive in toxicity to amphipods.

The glyphosate formulations (Rodeo® or AquaMaster®) proposed for use under this action, were selected for their low relative toxicity compared to other available formulations. By comparison, the LC<sub>50</sub> of Roundup® (glyphosate + EntryII® surfactant) to fish is 5 to 26 ppm and the LC<sub>50</sub> of R-11® (a common surfactant used with glyphosate) to fish is 3.8 ppm (SERA 1997).

**Table 1.** The Aquatic Toxicity of Glyphosate, Rodeo® or an Equivalent Formulation, and the Proposed Surfactant (LI-700®).

LC<sub>50</sub>= concentration lethal to 50% the sample population.

EC<sub>50</sub>= concentration at which 50% of the sample population exhibits an effect.

NOEC = concentration at which no observable effects are noted among the sample population.

	Glyphosate	Rodeo® or equiv.	LI-700®
Salmonid 96-hr NOEC	823 ppm <sup>(1)</sup>	1,500 ppm <sup>(1)</sup>	<100 ppm <sup>(5)</sup>
Salmonid 24-hr LC <sub>50</sub>		60 ppm <sup>(4)</sup>	140 ppm <sup>(5)</sup>
Salmonid 48-hr LC <sub>50</sub>			130 ppm <sup>(5)</sup>
Salmonid 96-hr LC <sub>50</sub>	580 ppm <sup>(2)</sup>	1,100 ppm <sup>(2)</sup>	130 ppm <sup>(5)</sup>
Invertebrate 48-hr NOEC			100 ppm <sup>(5)</sup>
Invertebrate 48-hr EC <sub>50</sub>	55 ppm <sup>(3)</sup>	5,600 ppm <sup>(3)</sup>	
Invertebrate 24-hr LC <sub>50</sub>			450 ppm <sup>(5)</sup>
Invertebrate 48-hr LC <sub>50</sub>	117 - 930 ppm <sup>(3)</sup>	218 -1,216 ppm <sup>(3)</sup>	170 ppm <sup>(5)</sup>
Invertebrate 96-hr LC <sub>50</sub>		720- 1,177 ppm <sup>(3)</sup>	190 ppm <sup>(6)</sup>

(1) Anton *et al.*

(2) Mitchell *et al.* 1987.

(3) Henry *et al.* 1994.

(4) Dow 2000.

(5) Loveland Industries, Inc. 2000.

(6) FS 2000.

### Vectors of Exposure.

Use of the injection method, proposed on 60 to 90% of the knotweed stems on BLM-administered lands in the Sandy River Basin, would avoid direct contamination from drift or indirect contamination from runoff since the herbicide would remain contained either in the applicator or the plant itself and no soil contamination would result. However, the injection method might increase the spill risk since concentrated Rodeo® (or Aquamaster) would be used and more time on site would be required. A spill event could result in localized and short-term effects. Due to their limited mobility, sac-fry and emergent fry would be at the greatest risk of extended exposure to lethal effect concentrations of glyphosate. NOAA Fisheries expects that the best management practices (BMPs) and project design features to be implemented for this project will minimize the potential for a spill to occur.

The proposed application concentrations (32,400 ppm for foliar application, 324,000 ppm for wicking, and 648,000 ppm for direct stem injection) exceed the known effect concentrations (Table 1) and therefore direct contamination may cause an affect on fish or invertebrates present in proximity to a stream entry point. The effect will largely be dependent on the degree and extent of contamination and the ability or inclination of the organism to avoid exposure. The

temporal and spatial extent of exposure would depend on the mixing zone needed to reduce contamination levels below the effect threshold concentration.

Mixing zone size would vary greatly and depend on the contamination volume (*e.g.*, drift or spill), the receiving volume (*e.g.*, 1 cfs or 30 cfs), the point of entry (*e.g.*, drift deposition or gravel bar inundation), and the amount of turbulence (*e.g.*, step-pool, slack water side channel), but are expected to be limited in size due to the turbulent character of headwater stream reaches and the volume of receiving waters (*e.g.* mainstem Sandy River and mainstem Salmon River) in lowland reaches. Hydrologically complex waterways with meanders, pools, riffles, and eddies that accelerate mixing and dilution are more likely to disperse contaminants than simplified waterways with consistent channel velocities that allow contaminants to maintain a more consolidated profile (Lee 1995, Heard *et al.* 2001). Mixing distances are shorter in smaller streams and mixing is slower when the discharge point is near the streambank (Heard *et al.* 2001). A recent study of transverse mixing distances in small streams ( $1.4$  to  $3.5 \text{ ft}^3 \text{ s}^{-1}$ ) in eastern Iowa found heterogeneity in tracer concentrations 16.4 feet to more than 328 feet downstream of mid-channel release points (Heard *et al.* 2001). Unfortunately, short of empirically determining mixing distances for specific stream reaches, the ability to predict mixing lengths quantitatively is not yet feasible (Heard *et al.* 2001).

Input locations would be distributed along several miles of stream (approximately two miles) and river (approximately seven miles), and exposure concentrations are expected to be below lethal response thresholds. Because treatment of most of the areas of knotweed infestation on BLM lands is expected to be completed during 2003 and 2004, the greatest risk of surface water contamination and aquatic effects are expected to occur during those years.

Rainbow trout fry have been observed to avoid glyphosate (Vision<sup>®</sup>) at concentrations equal to 50% of the  $\text{LC}_{50}$  value (Morgan *et al.* 1991). Vision<sup>®</sup> is a glyphosate salt formulation containing either 10% or 15% surfactant (similar to Roundup<sup>®</sup>). The same study (Morgan *et al.* 1991) found juvenile rainbow trout did not avoid short-term exposure ( $\leq 1$  hour) to Vision<sup>®</sup> until the 96-hour  $\text{LC}_{50}$  value was exceeded. Therefore, LCR steelhead and LCR chinook salmon may not avoid exposure to lower glyphosate concentrations by relocating. Sublethal affects on fish have been documented at exposures for various contaminants at concentrations less than 1% of their  $\text{LC}_{50}$  value.

As stated above, more than 90% of the applications (direct stem injection, wicking, and foliar application) will occur from May through October, and will cease at the onset of the rainy season in late October. Juvenile LCR steelhead and LCR chinook salmon rear in the Sandy River and certain tributaries year-round. LCR steelhead spawning peaks in April and early-May, with eggs and sac-fry being present in stream gravels until early-July. Both spring- and fall-run LCR chinook salmon are present in the Sandy River basin, which means that adults may be present during most months of the year, and eggs or fry in the gravels from September through April.

The BLM completed “worst case scenario” analyses of a runoff event (rain storm) and a direct spill (BA pages 10-13), and estimated potential endpoint concentrations of glyphosate and

surfactant contamination in streams at several orders of magnitude below salmonid or invertebrate effect concentrations. An analysis by the BLM of a theoretical spill event found only localized and short-term effects were likely to occur. The BA states that “in the past 3 years, TNC has never spilled more than incidental quantities of any herbicide, either in the water or on the ground.”

Any contamination of flowing water is expected to move downstream and decline rapidly as mixing occurs and glyphosate binds to particulates (Solomon and Thompson 2003), although elevated concentrations may persist in near bank areas, eddies, and side channels with slower velocities. The preponderance of evidence suggested by the literature indicates that the use of glyphosate near the water poses a minimal risk of long-term adverse affects on salmonids or their prey base (Morgan *et al.* 1991, Norris *et al.* 1991, Anton *et al.* 1994, Gardner and Grue 1996, Simenstad *et al.* 1996, FS 2000, Kilbride and Paveglio 2001). Any affects to freshwater invertebrates would likely be of limited temporal and spatial extent as well. Therefore, any contamination would represent short-term, non-lethal exposure for LCR steelhead and LCR chinook salmon, and would not significantly reduce their prey base. To some extent this finding is based on the assumption that existing background chemical contamination is minimal and not of such character as to cause a synergistic or threshold effect to occur.

#### **2.1.3.2 Cumulative Effects**

Cumulative effects are defined in 50 CFR 402.02 as “those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation”. This is step 4 in NOAA Fisheries’ analysis process. Approximately 73% (70% Forest Service and 3% BLM) of the lands in the Sandy River Basin are under Federal management. Future Federal actions are being, have been, or will be reviewed through separate section 7 consultations. The remaining 27% of land in the Sandy River Basin is privately owned. Land use on these non-federal lands include timber production, agriculture, and rural and urban development. According to the BA, TNC has been using glyphosate to control knotweed on private lands in the Sandy River Gorge for the past three years, and anticipates continuing this program. In addition, chemical fertilizers or pesticides are used on many of these private lands for other purposes, but no specific information is available regarding their degree of use within the project area. Furthermore, NOAA Fisheries does not consider the rules governing these land uses on these non-federal lands within Oregon to be sufficiently protective of watershed, riparian, and stream habitat functions to support the survival and recovery of listed species. Therefore, these habitat functions likely are at risk due to future activities on non-federal lands within the basin. NOAA Fisheries is not aware of any other specific future non-federal activities within the action area that would cause greater impacts to listed species or their habitat than presently occurs.

#### **2.1.4 Conclusion**

After reviewing the best available scientific and commercial information available regarding the status of the LCR steelhead and LCR chinook salmon ESUs considered in this consultation, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NOAA Fisheries opinion that the action, as proposed, is not likely to jeopardize the continued existence of these species. Our conclusion is based in the following considerations: (1) Only low toxicity glyphosate formulas and water carriers will be used; (2) the time, place and manner of herbicide application will be strictly limited to ensure that any short-term effects to riparian and aquatic habitats will be minor and timed to occur at times that are least sensitive for the species' life-cycle; and (3) the effects of this action are not expected to impair currently properly functioning habitats, appreciably reduce the functioning of already impaired habitats, or retard the long-term progress of impaired habitats toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale.

Our conclusion is based on the following considerations: (1) Low toxicity herbicides (Rodeo® or AquaMaster®) and the surfactant (LI-700®) are proposed for use in areas that may allow aquatic contamination to occur; (2) water is the only carrier agent used in Rodeo® or AquaMaster®; (3) glyphosate binds strongly with soils which minimizes the potential for runoff to transport herbicide to streams; (4) herbicide application will not occur in or over water; (5) prey base effects are expected to be spatially and temporally limited, (6) it is estimated that 75% of the knotweed patches would be treated once, 25% may need to be treated twice and 1% three times, thus limiting the potential for multiple exposures of listed fish to the herbicide; (7) repeat applications of glyphosate have not been found to cause long-term adverse affects; (8) an estimated 60 to 90% of the knotweed will be treated by direct injection of the herbicide into the plant stems, thus eliminating the potential for drift or runoff; (9) wind limits during foliar applications will minimize the risk of direct contamination of waterways; (10) no application will occur when precipitation is forecast within 24 hours to minimize the risk of indirect water contamination via ground transport; (11) staging areas will be in areas that will not contaminate surface or ground water, (12) herbicide use to control knotweed will be significantly reduced after 2 years; (13) aggressive knotweed control now will reduce long-term total herbicide use in riparian areas on BLM-administered lands in the Sandy River Basin by reducing the potential for future knotweed infestations, and (14) less than 0.02% of BLM-administered lands in the Sandy River Basin are infested with knotweed and would be treated by this project.

#### **2.1.5 Conservation Recommendations**

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species or to develop additional information.

The following conservation recommendations are consistent with these obligations, and therefore should be implemented by the BLM:

1. To minimize the amount of chemical herbicides used beside streams, the BLM should work to develop effective non-chemical treatments to control invasive plants.
2. To minimize the use of chemical herbicides in the future, the BLM should develop a watershed-based prevention and control strategy for invasive plants in cooperation with non-federal land owners, and particular consideration for Dawson and Holland's (1999) recommendations for invasive plant control.

For NOAA Fisheries to be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed species or their habitat, NOAA Fisheries requests notification of the implementation of any conservation recommendation.

### **2.1.6 Reinitiation of Consultation**

Consultation must be reinitiated if: (1) The amount or extent of taking specified in the incidental take statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

Additionally, if the BLM fails to provide the specified annual monitoring information by the required date (see section 2.2.3, term and condition #3), NOAA Fisheries will consider that a modification of the action that causes an effect on listed species not previously considered and causes the incidental take statement of the Opinion to lapse.

To reinitiate consultation, the BLM must contact the Habitat Conservation Division (Oregon Habitat Branch) of NOAA Fisheries at 525 NE Oregon Street, Suite 500, Portland, Oregon 97232-2778, and refer to NOAA Fisheries 2003/00729.

## **2.2 Incidental Take Statement**

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." [16 USC 1532(19)] Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." [50 CFR 222.102] Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such

an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.” [50 CFR 17.3] Incidental take is defined as “takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant.” [50 CFR 402.02] The ESA at section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement [16 USC 1536].

An incidental take statement specifies the effect of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize adverse effects and sets forth terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

### **2.2.1 Amount or Extent of the Take**

NOAA Fisheries anticipates that the action covered by this Opinion is reasonably certain to result in incidental take of LCR steelhead and LCR chinook salmon from contamination of streams with Rodeo® or AquaMaster® herbicide and the surfactant LI-700®. The effect of actions such as this are largely unquantifiable because take is in the form of harm, which includes habitat modification. Quantifying take associated with habitat modification is problematic because of the complexity of cause and effect relationships. Therefore, even though NOAA Fisheries expects some low level of incidental take to occur due to the actions covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NOAA Fisheries to estimate a specific amount of incidental take to the species. Based on the information in the BA, NOAA Fisheries anticipates that an unquantifiable amount of incidental take could occur, predominately in a non-lethal form, as a result of actions covered by this Opinion. In instances such as these, NOAA Fisheries designates the expected level of take in terms of the extent of take allowed. For the proposed action, allowed take is limited to take in stream reaches immediately beside treatment areas and extending a distance not to exceed 100 feet downstream resulting from the use of Rodeo®, AquaMaster®, and LI-700® in the manner proposed by the BLM, including project design features. Take that occurs from actions that do not follow the project design features or that extends beyond the action area is not authorized by this Opinion.

### **2.2.2 Reasonable and Prudent Measures**

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to avoid or minimize take of LCR steelhead and LCR chinook salmon resulting from implementation of this Opinion.

1. Minimize incidental take from the proposed activity by following the proposed project design features described in the BA.

2. Minimize incidental take associated with herbicide application by implementing additional time, place, and type of application use restrictions on the use of glyphosate to minimize contamination of streams.
3. Complete an annual report for five years to ensure this Opinion is meeting its objective of minimizing the likelihood of take from the proposed activity and provide the report to the Oregon Branch of NOAA Fisheries.

### **2.2.3 Terms and Conditions**

To be exempt from the prohibitions of section 9 of the ESA, the BLM must ensure TNC compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. Implementation of the terms and conditions within this Opinion will further reduce the risk of adverse effects to LCR steelhead and LCR chinook salmon. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure #1 (project design features), the BLM shall ensure that all project design features provided in the BA (BA, pages 5 and 6; repeated in this Opinion in section 1.2) are followed.
2. To implement reasonable and prudent measure #2 (additional use restrictions), the BLM shall ensure:
  - a. In stream reaches where foliar application of glyphosate (Rodeo or Aquamaster or similar formulation) is used to treat knotweed growing in dry portions of the stream channel below the ordinary high water elevation, application is limited to the preferred in-water work period for the Sandy River between July 15 and August 31.
  - b. No herbicides, surfactants, or other adjuvants other than those identified in the proposed action are applied.
  - c. The contracted applicator is aware of the provisions of this Opinion before commencing herbicide application operations.
  - d. The contracted applicator has a spill response plan and is familiar with use of the spill kit before commencing herbicide application operations.
  - e. All chemical storage, chemical mixing, and post-application equipment cleaning is completed in such a manner as to prevent the potential contamination of any riparian area, perennial or intermittent waterway, ephemeral waterway, or wetland.
  - f. Erosion control measures (*e.g.*, silt fence, native grass seeding) are used where de-vegetation may result in the significant delivery of sediment to LCR steelhead or LCR chinook salmon habitat.
3. To implement reasonable and prudent measure #3 (annual monitoring and reporting requirements) the BLM shall ensure:

- a. An annual report of herbicide treatments to control knotweed on BLM-administered lands by 5<sup>th</sup> Field Watershed within the Sandy River 4<sup>th</sup> Field Watershed is submitted to NOAA Fisheries. The report will cover the herbicide application period (May 1 - October 31) for the calendar year and is due December 31 of that year. The purpose of the reporting is to help estimate the extent and amount of take that may have occurred and validate assumptions regarding watershed effects. Each annual report shall contain an application record and watershed summary.
  - i. The herbicide application record shall contain, at a minimum, the following information by watershed:
    - (1) Date of application.
    - (2) Site treated.
    - (3) Treatment method (direct injection, wicking, foliar application).
    - (4) Quantity of herbicide used.
    - (5) Weather conditions (*e.g.*, wind, precipitation) during application periods and notation of any precipitation occurring within a 24-hour period following treatment.

*Appendix A* contains an example recording form, but any organized format may be used to present the information.
  - ii. The watershed summary shall provide, at a minimum, the total acreage treated and the total herbicide applied by 5<sup>th</sup> Field Watershed. *Appendix B* contains an example watershed summary form, but any organized format may be used to present the information.
- b. Send the annual report to NOAA Fisheries at:

NOAA Fisheries  
Oregon Habitat Branch  
**Attn: 2003/00729**  
525 NE Oregon Street, Suite 500  
Portland, OR 97232

If the BLM fails to provide the specified annual monitoring reports by January 31 of the following year, NOAA Fisheries may consider that a modification of the action that causes an effect on listed species not previously considered and causes the incidental take statement of this Opinion to lapse. Exceptions must receive NOAA Fisheries' agreement in writing before the due date.

This programmatic incidental take statement shall expire on December 31, 2008.

### **3. MAGNUSON-STEVENSON ACT**

#### **3.1 Magnuson-Stevens Fishery Conservation and Management Act**

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of EFH: “Waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle (50CFR600.110).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;
- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reason for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

### **3.2 Identification of EFH**

The Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Pacific salmon: Chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other waterbodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the *Pacific Coast Salmon Plan* (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based on this information.

### **3.3 Proposed Action**

The proposed action is detailed above in section 1.2 of this document. The action area includes the Sandy River Basin. This area has been designated as EFH for various life stages of chinook salmon and coho salmon.

### **3.4 Effects of Proposed Action**

As described in detail in the ESA portion of this consultation, the proposed activities would result in detrimental, short-term, adverse effects to a variety of habitat parameters.

### **3.5 Conclusion**

NOAA Fisheries believes that the proposed action will temporarily adversely affect the EFH for coho salmon and chinook salmon.

### **3.6 EFH Conservation Recommendations**

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or state agency action that would adversely affect EFH. In addition to conservation measures proposed for the project by the BLM, all of the reasonable and prudent measures and the terms and conditions contained in sections 2.2.2 and 2.2.3, respectively, of the ESA portion of this Opinion are applicable to salmon EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

### **3.7 Statutory Response Requirement**

The MSA (section 305(b)) and 50 CFR 600.920(j) requires the BLM to provide a written response to NOAA Fisheries' EFH conservation recommendations within 30 days of its receipt of this letter. The response must include a description of measures proposed to avoid, mitigate,

or offset the adverse impacts of the activity on EFH. If the response is inconsistent with NOAA Fisheries' conservation recommendations, the BLM shall explain its reasons for not following the recommendations.

### **3.8 Supplemental Consultation**

The BLM must reinitiate EFH consultation with NOAA Fisheries if either the action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

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**APPENDIX A**  
Annual Site Record Example